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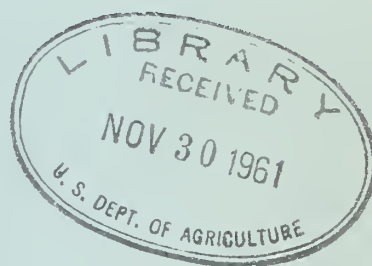
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TECHNICAL EQUIPMENT REPORT NO. 5700-1

APRIL 1961

WING-MOUNTED PARACARGO CONTAINERS FOR LIGHT AIRPLANES

BY

MISSOULA EQUIPMENT DEVELOPMENT CENTER
FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE
MISSOULA, MONTANA



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WASHINGTON, D. C.

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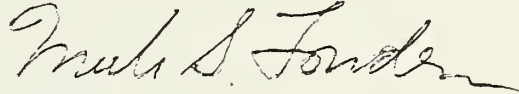
UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
WASHINGTON 25, D.C.

IN REPLY REFER TO

April 1961

The wing-mounted paracargo mountings and containers described in Technical Equipment Report No. 5700-1 are approved for optional U. S. Forest Service use. Specifications, including reduced drawings, are in the report. Full-size drawings may be obtained from the Missoula Equipment Development Center. An electrical release mechanism of the cargo shackle is used on the Cessna 180 and 182. For maximum safety the mechanical release should be used as an alternate system.

When containers are attached to cargo shackles on the Cessna 180 and 182 and the Piper Cub, the aircraft is subject to the limitations of CAR Part 8 and no passengers will be carried.



MERLE S. LOWDEN, Director
Division of Fire Control



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~~WING-MOUNTED PARACARGO CONTAINERS FOR LIGHT AIRPLANES~~

Missoula Equipment Development Center
Forest Service, U. S. Department of Agriculture
Missoula, Montana

April 1961

INTRODUCTION

Light four-place aircraft play an important part in the protection and management of national forests. Small ships are used in aerial reconnaissance, personnel and cargo transportation (field to field) and paracargo delivery. Forest Service flying, for the most part, is done with rented aircraft. Small aircraft are readily available across the nation and can be contracted on part-time or seasonal basis at economical rates. Their limited capacity prohibits the dropping of large bulky paracargo bundles but during normal seasons small aircraft can usually handle all the air supply work on most forests. Special jobs, such as the dropping of large fire camps, lookout tower construction materials and bulky bundles over 125 pounds, are usually accomplished with DC-3 and Twin Beech aircraft. Larger ships, however, cannot be used economically on air detection and reconnaissance flights nor can they operate from substandard back-country airfields.

Small ships are often dispatched on dual-purpose missions involving air detection and paracargo delivery. Thus, the entire flight must be made with the door removed or the cargo dropper-observer must hold the door open against the airstream pressure and simultaneously force the bundle and parachute out alongside the fuselage. In the latter case, likelihood of tail collision, snagging or entanglement of the cargo parachute and bundle are increased. Long flights with the doors removed are extremely noisy and can be quite uncomfortable. In either event a cargo dropper must accompany the flight to discharge the cargo. Forest Service Handbook 5714.5 states that: "A pilot shall not attempt to drop cargo alone unless the aircraft is equipped with FAA approved remote cargo-release devices."

SUMMARY

Two systems have been developed for dropping cargo from the wings of light aircraft. One is a 13-inch diameter cylindrical streamlined metal tube, pivoted at the front end from which cargo parachute

and bundle are ejected when the pilot releases a cable to drop the rear end of the container. This type is adaptable to light aircraft with double struts. The forward strut contains the pivot system and the rear strut contains the locking and release mechanism for the rear end of the container. As a rule, these containers are left on the aircraft at all times but can be easily and quickly removed if desired. The one disadvantage is that the container creates an obstacle to side vision. However, pilots who tested this installation felt that this was a negligible factor. The most outstanding advantage is that the parachute is positively shielded and no special parachute rigging modifications are required.

A second system which is particularly adaptable to the Cessna 180 is a wing cargo (bomb) shackle system with externally suspended loads. This method requires the installation of an approved military cargo shackle under each wing. Installation for the Cessna 180 is covered in Supplemental Type Certificate No. SA4-868 issued to the Forest Service in May 1959. (See Appendix A.) Chief advantage of this system is that after the drop is completed the aircraft is completely free and side vision is unrestricted.

There are two basic types of wing containers used with cargo shackles. One is a cylindrical container fabricated from rigid materials such as pressed ~~paper~~ plywood or fiberglass. The main advantage of these containers is that they are more streamlined and offer slightly less drag during flight. These containers are from 20 to 54 inches long and 16 inches in diameter and will accommodate many Forest Service air cargo items. They can be used for dropping subsistence, tools, power saws and in general, almost any item of equipment which can be inserted in a 16-inch cylinder. Cargo dropped in these containers should be packed with honeycomb paper or other inexpensive wadding to prevent shifting of contents during opening shock and landing. The plywood container is a low-cost item and recovery could be optional depending upon accessibility of the drop zone.

The second type consists of a rectangular fiber carton enclosed in a canvas bag and supported by a webbing harness equipped with shackle rings. An elastic hood and an internal lacing cover are employed to prevent premature opening of the parachute.

Flight tests with the Cessna 180 with wing cargo containers showed no adverse effect on aircraft performance. With constant 2,300 rpm and 20 inches manifold pressure, the airspeed reduction due to drag was 10 mph. Experienced pilots felt that reserve power was entirely adequate for normal flight maneuvers. (See Appendix A.)

Forest Service parachutes when used with externally suspended loads must be shielded from airstream buffeting and must have rigging modifications to ensure the canopy will be deployed without leaving the static line trailing from the aircraft. The break cord is moved from the canopy apex to the free end of the static line. Requirements, modifications and rigging instructions covering various externally suspended wing containers are shown in Appendixes C and D.

Most military reconnaissance aircraft are equipped with wing cargo shackle systems and these have been used extensively in army supply operations for a number of years. Military cargo parachutes differ from Forest Service standard cargo parachutes in that the container assures protection against derangement and is held in place with heavy lacing. They can withstand airstream buffeting, whereas, Forest Service cargo parachutes must be shielded or otherwise protected to prevent premature opening. The Forest Service uses many types and variations of civilian and converted military cargo parachutes, therefore, wing borne cargo parachutes must be protected from airstream buffeting or external forces which could cause premature parachute deployment. Externally suspended wing cargo containers developed by the Missoula Equipment Development Center employ elastic-hemmed protective covers and lacing collars to prevent accidental release of the cargo parachute.

In military wing cargo systems, static lines are snapped to the aircraft and after the drop the static line and parachute cover panel flutters in a trailing attitude from the attachment point on the wing. Cargo containers shown in this report leave the aircraft completely free after the drop. The static line does not remain with the aircraft after the drop because it is permanently fastened to the parachute apex with a strong cord. A break cord on the free end of the static line is fastened to the aircraft thus all components of the parachute stay together.

CONCLUSIONS

Small aircraft equipped with external cargo-dropping devices have greater capability and can perform multipurpose missions more economically. Wing cargo drop systems offer the following advantages:

1. The load is instantly jettisonable and under emergency conditions can be dropped much faster than cargo carried in the cabin.
2. The cargo bundle is outboard away from the tail and fuselage where entanglement or tail collision is minimal.

WING MOUNTED PARACARGO CONTAINERS FOR STINSON VOYAGER

Over the past few years, MEDC has developed several wing cargo drop systems. The first of these was used on the military L-5 reconnaissance aircraft, some of which were used by the Forest Service immediately following World War II. This first wing cargo container was used in Region 1 until the L-5 aircraft became obsolete.

Later a wing mounted paracargo device was developed for the Stinson Voyager. This was similar to the L-5 container consisting of a metal cylindrical container installed at the outboard strut anchor bolts. The nose of the container was mounted upon a pivot which allowed the rear end of the container to drop down when released by the pilot. A pin locked release gate would open the container, the cargo would slide out and the parachute was deployed by a short static line attached to the inside rod. (See Figures 1 through 5.) A standard cargo parachute and bundle can be inserted in the wing container and dropped with no special preparation other than that used in normal air cargo.

This device met all FAA engineering tests and was used in Region 1 for several years until Stinson Voyager was replaced. Approval data are on file at Aircraft Engineering Division, Seattle, Washington. With minor modifications this particular design could be easily adapted to Super Cubs or other light aircraft which have double struts.



Figure 1

Stinson Voyager with FAA approved wing cargo containers.
See Drawing No. ED-24-R1.



Figure 2

Wing container in discharge position. Load, bottom left, with parachute attached slide out. Parachute is deployed by short static line fixed to axle rod from inside container. Air stream pressure returns container to latched position after drop is completed.



Figure 3

Front view. Container has bearings at each side to provide free swing on axle rod. Axle rod is clamped to strut.

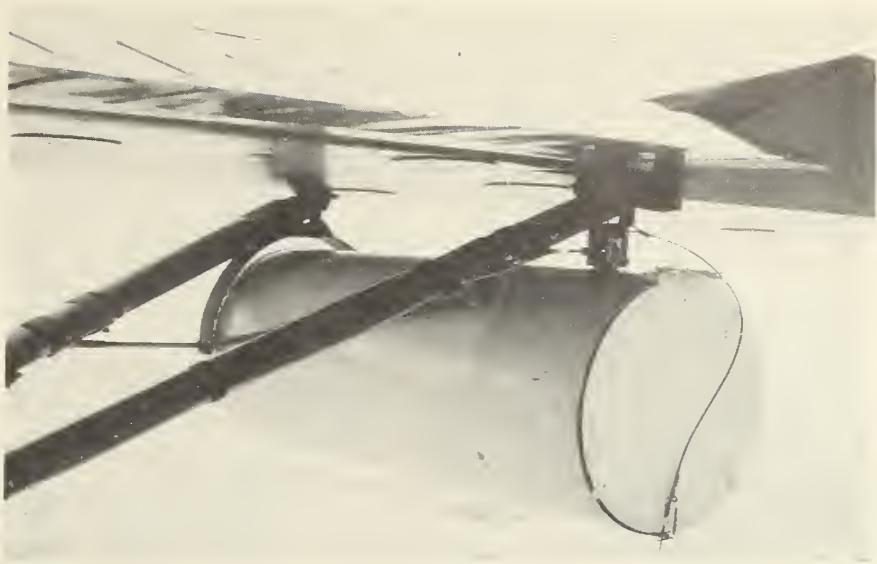


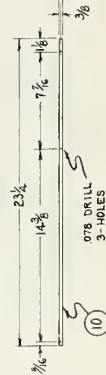
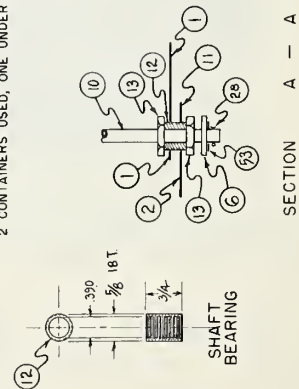
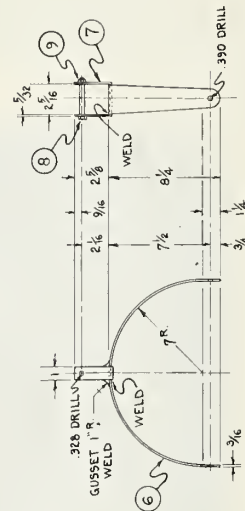
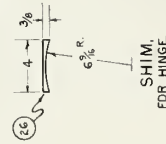
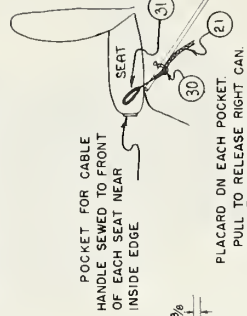
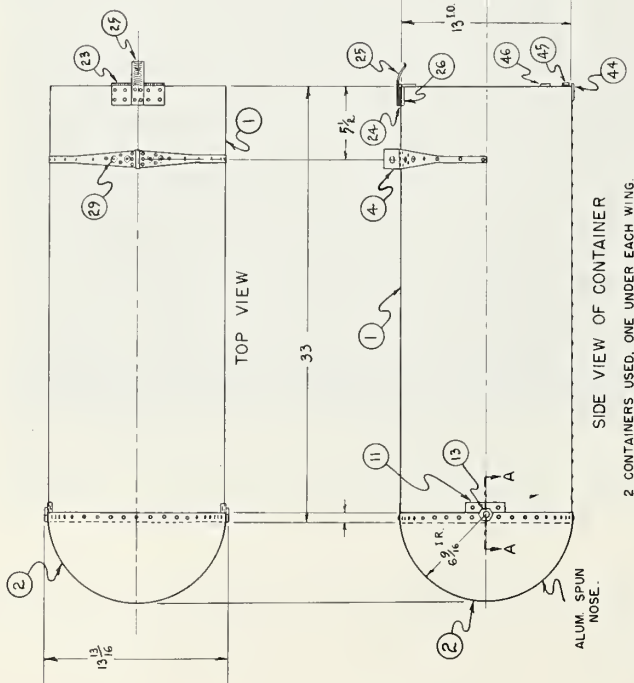
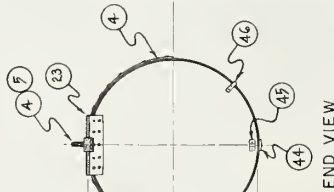
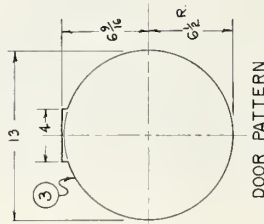
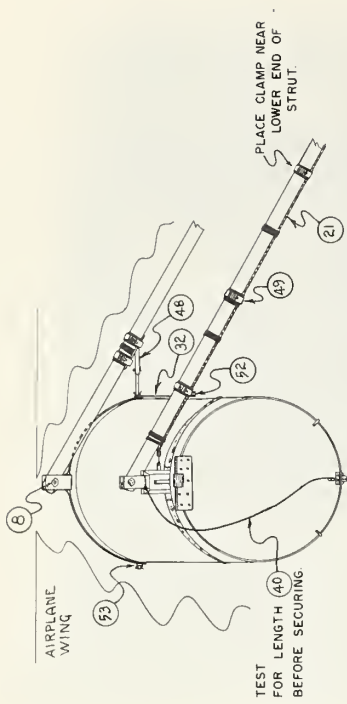
Figure 4

Rear side view. Pin at rear top center engages spring loaded release pin in latch installed at rear strut. Container lid is held in place during flight by spring locked pin. Lid stays open after drop.



Figure 5

Pilot releases load by sharp jerk on latch cable. Release cables are stowed in pockets stitched to seat front.



4-10	TRACED & MATERIALS LIST	ARF
UNIT		
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE		
MISSOURI EQUIPMENT DEVELOPMENT CENTER		
CARGO CONTAINERS, ATTACHMENTS FOR STINSON VOYAGER 150		
STINSON 150	Q, R, S, T	REASON FOR REMOVAL
ATTACHMENT	F, O, B, W	
APPROVED	C, U, W	
PLANT	AS Spec	ED-24-R-1
PLANT	AS Spec	UNIT NO.
PLANT	AS Spec	DATE
PLANT	AS Spec	MARCH 1961

CARGO CONTAINER - ATTACHMENT FOR STINSON VOYAGER 150

 DWG. NO. ED-24-R1
 APRIL 1960

MATERIALS LIST

Name	Material	Part No. No.	Part No. Req.	Cutting Size	Size	Specification or Number	Type
Container, Main	Aluminum	1	2	33"x42"	.067		24ST
Nose, Container	"	2	2	26"x26"	.032	Alum. Spun	3S
Door, Container	"	3	2	13"x13-1/16"	.064	As Spec.	24ST
Fin	Steel	4	4	1 1/2"x11 1/2"	.032	" "	X41-30
Spacer, Fin	"	5	2	1 1/4"x1 1/2"	1/8"		X41
Yoke	"	6	2	2-5/16"x25"	3/16"	As Spec.	X41-30
Clevis, Yoke	"	7	2	2-5/16"x 7-9/16"	5/32"	" "	X41-30
Bolts, for Parts No. 6 & 15	"	8	4	3"	5/16", 24T	AN 5-30	
Nuts, for Part No. 8	Steel & Fiber	9	4		5/16", 24T	AN5-365-524	Fiber-Lok
Shaft	Steel	10	2	23 1/4"	3/8"x .045 wall		X41-30
Filler, Nose	Aluminum	11	4	5/8"x3"	.032		3S
Bearing, Shaft	Bronze	12	4	3/4" long	390 I.D. 5/8", 18T	As Spec.	
Nuts, Retainer, Bearing	Steel	13	8		5/8", 18T		
Release Box	Aluminum	14	2	1"x2"x2"			24ST

MATERIALS LIST

Name	Material	Part No.	No. Req.	Cutting Size	Size	Specification or Number	Type
Bracket, Release Box	Steel	15	2		5/32"x1"	As spec.	X41-30
Housing, Release Box	Steel Channel	16	2	6 1/4"	2"x3/8"x1/16"		X41-30
Latch, Release, Female	Steel Case Hardened	17	2	1 1/2"	3/8"D.	5/16", 24T. As Spec.	10-25
Latch, Release, Male	Steel Case Hardened	18	2	7/8"	3/8"D.	" "	10-25
Spring, Latch Release	Spring Steel	19	2	1 1/4"x7/8"	1/32"		Compression
Cable	Aircraft Steel	20	2	18'	1/16"	AN-C-43	7x7
Cable Housing	Stainless Steel	21	2	15'	1/4"		
Bolts w/nuts, for Parts No. 14 & 16	Steel & Fiber	22	4	1 1/4" long	1/8", 40T.	AN526-1032-24	
Hinge, Piano	Stainless Steel	23	2	4"	1"	.051 Thick, AN251	
Shim, Door Stop	Aluminum	24	2	1"x4"	1/8"		
Door Stop	Spring Steel	25	2	1"x4"	1/16"		
Shim, Hinge	Aluminum	26	2	1"x4"	3/8"	As Spec.	
Rivets, For Parts No. No. 1, 2, 4 & 11	"	27	As Req.	3/16" long	1/8"	AL7ST	

MATERIALS LIST

Name	Material	Part No.	Cutting Size	Size	Specification or Number	Type
Cotter pins for Part No. 10	Steel	28	6 1"	1/16"		
Bolts, w/nuts for Part No. 4	Steel & Fiber	29	8 3/8" long	3/16", 28T.		Fiber-Lok Nut
Clamp	Steel	30	4		AN-748-38	Ideal
Handle, Cable	Plastic Tubing	31	4 10"	3/16"	Bright Colors - 1 red 1 green	
Brace, Shaft	Steel Tubing	32	2 24" long	1/2"x .045 Wall	As Spec.	X41-30
Clevis, Shaft Brace	Steel	33	2		As Spec.	
Nuts, for Part No. 33	"	34	4	3/8", 24T.		
Bolt, Brace Clevis	"	35	2 3/4" long	1/4", 28T.		
Nut, for Part No. 35	Steel & Fiber	36	2	1/4", 28T.		Fiber-Lok
Bushing, for Part No. 14	Bronze	37	2 3/4" long	.390 I.D. 1/2" O.D.	As Spec.	
Cotter Pin, for Parts No. 16 & 17	Steel	38	2 1 1/2" long	1/16"		
Sleeve, Micropress	Metal	39	4	1/16"	Aircraft	
Cable, Door Release	Aircraft Steel	40	2 24"	1/16"	AN-C-43	7x7

MATERIALS LIST

Name	Material	Part No.	Req.	Cutting Size	Size	Specification or Number	Type
Spring, Door Release	Spring Steel	41	2	1½"	3/16"x.0156"		Extension
Pin, "	Steel	42	2	3"	.080	Piano Wire	
Pin Plate, "	Aluminum	43	2	1"x½"	.064	As Spec.	Aircraft Aluminum
Pin Latch, "	"	44	2	1¼"x½"	.064	" "	" "
Pin Guard, "	"	45	2	1½"x1-1/8"	.064	" "	" "
Door Stops	"	46	4	½"x1"	.064	" "	" "
Rivets, for Parts No. 3, 23, 25, 16, 44, 45 & 46	"	47	As Req.	As Req.	1/8"		" "
Bracket, Shaft	Steel	48	2	1" wide		As Spec.	X41-30
Clamp	"	49	10	13" long	.032	As Spec.	X41-30
Bolts, for Part No. 49	"	50	10	½" long	1/8", 40T.		Aircraft
Nuts, for 50	Steel & Fiber	51	10		1/8", 40T.		Fiber-Lok
Bracket, Shaft Brace	Steel	52	2	1-¼"x1"	3/16"	As Spec.	
Washers, Shaft	"	53	4		3/8"		Cut
Pin Stop	Solder	54	2			Solder Small Collar on Pin	

PLYWOOD CARGO CONTAINERS FOR CESSNA 180 AIRPLANE



Figure 6

Plywood cargo drums on Cessna 180. Parachute is stowed in nose section and covered by elastic cover. Drum length is 55 inches



Figure 7

Plywood cargo containers may be built to desired length. Minimum drum length tested was 20 inches, maximum length was 55 inches. See Drawing No. ED-120-R1.



Figure 8

Static line, tied to aircraft with one turn of 80-pound tape, pulls elastic covers off, breaks inner lacing cover and deploys parachute. Eighty-pound tape breaks at last stage of deployment, leaving aircraft free with no trailing static line. Rigging instructions are shown in Appendix C.



Figure 9

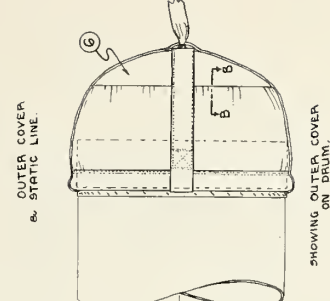
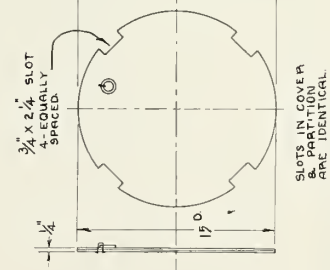
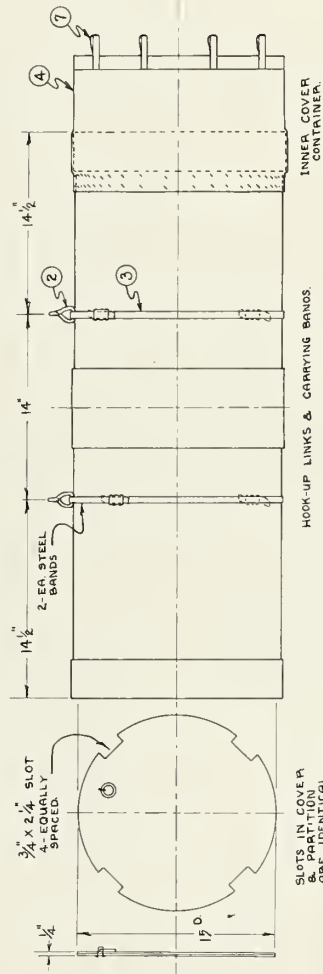
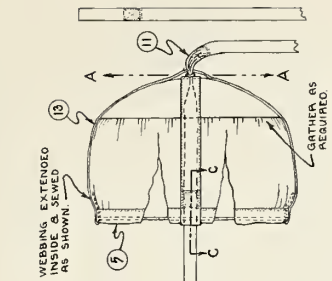
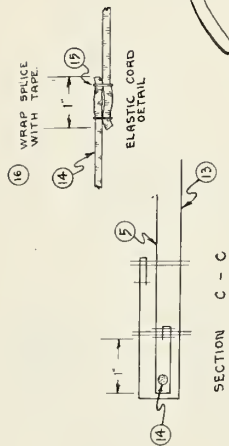
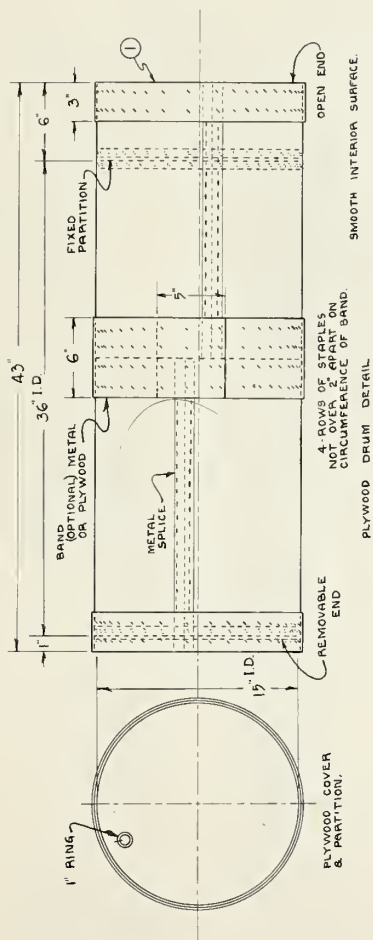
A 10-man double-tool outfit can be stowed in plywood drum.



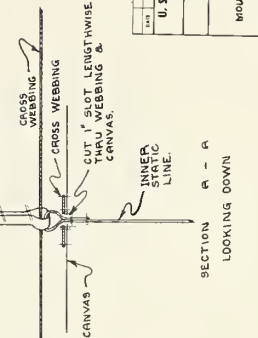
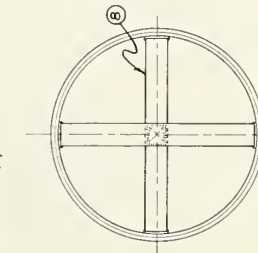
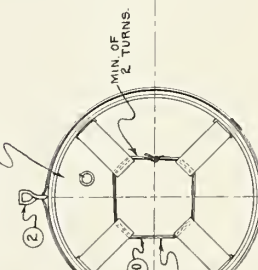
Figure 10
Container end plate is held in place by webbing harness loops laced with parachute cord.



Figure 11
Plywood drum descending on 24-foot diameter cargo parachute.



NOTE: ALL STITCHING:
FED-STG-NO 79, TYPE 301.



U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	
REGIONAL FOREST OFFICE WASHINGTON, D. C.	
PROJECT NUMBER ED-120-A1	
DATE JULY 1958	

MATERIALS LIST TO ACCOMPANY DWG. NO. ED-120-RI

Name	Material	Part No. No.	Req.	Cutting Size	Color	Size	Specification or Number	Type
Drum, complete with Partition and cover	2-Plywood	1	1	As Shown on Dwgs.	Natural	15" I.D. Specify Length	Seymour & Peck Co. or Equal	Best Quality
Links, Connector, Modified	Steel	2	2		Cadmium	5/8"x1-3/4" I.D.	AN 6562-1	
Bands	"	3	4	50"	Black	1/2"	Signode or Equal	
Cover, Inner Lacing	Cloth, Cotton Duck	4	1	14-7/8"x 51-3/4"	Natural	#10	CCC-C-419 Table I	I
Cover, Outer, Main Panel	"	5	1	11"x54"	"	"	"	" I
Cover, Outer, Top Panel	"	6	1	16" dia.	"	"	"	" I
Loops, Lacing	Webbing Cotton	7	8	5"	"	9/16"	MIL-W-5665a	I
Harness	"	8	2	78"	Optional	1-3/4"	MIL-W-5665a	VIII
Adapters	Steel	9	4		Cadmium	1-3/4"	AN-6565-1	Style "A" III
Cord, Parachute	Nylon	10	1	72"	Optional		MIL-C-5040	III
Static Line, Outer	Webbing, Cotton	11	1	80"	"	1-1/4"	MIL-W-5665a	III
Static Line, Inner	"	12	1	40"	"	1-1/4"	"	III
Webbing, Outer Cover Reinforcing	"	13	2	18"	"	1-1/4"	"	III

MATERIALS LIST TO ACCOMPANY DWG. NO. ED-120-R1

Name	Material	Part No.	No. Req.	Cutting Size	Color	Size	Specification or Number	Type
Cord, Elastic	Rubber & Cotton	14	1	28"	Optional	3/16" dia.	MIL-C-5650 Table I	I
Ring, Hog	Metal	15	2			No. H1	Hill Pattern. Seymour Mfg. Co. or Equal	
Tape, Adhesive	Fabric & Adhesive	16	As. Req.				Optional	
Thread	Cotton	17	As. Req.		Optional	12/4 Cord	V-T-276b Ticket #12	1B3

MILITARY FIBERGLASS CARGO CONTAINER

MEDC was recently requested to evaluate a fiberglass cylindrical container developed expressly for military reconnaissance aircraft. Large numbers of these containers have recently been offered the Forest Service at no cost as surplus equipment. (Original government acquisition was \$65.00.) Their availability obviates the need for the purchase or fabrication of other containers.

This is an excellent wing cargo container and is described; container, plastic, aerial delivery, M-6, number 1670-H09-0469. It is extremely durable and is constructed as a "knockdown unit." The disadvantages are that it is rather heavy (50 pounds) and is not adaptable to Forest Service cargo parachutes. It must be used with a specific military parachute which is built expressly for this container. Special spring clasps are required for attaching the parachute to the fiberglass container. This parachute assembly is listed in Department of Army supply manuals as Parachute Cargo 28-foot Diameter Converted T7A 500-pound Capacity; Part No. AF54B6085; Federal Stock No. 1670-038-4413 Index No. 6. One rigging modification is required. This is to attach the end of the static line to the apex bridle cord of the canopy by a single turn of 550-pound Type III, parachute cord. The static line snap hook is fastened to the aircraft with a break cord of two turns of 80-pound 1/4-inch cotton tape tied with square knot followed by two overhand knots. (See rigging instructions, Appendix B.)



Figure 12

Military fiberglass wing cargo container has webbing hand grips to facilitate handling and loading.



Figure 13

A complete two-man fire pack outfit with extra rations and five gallons of water can be dropped in one container.

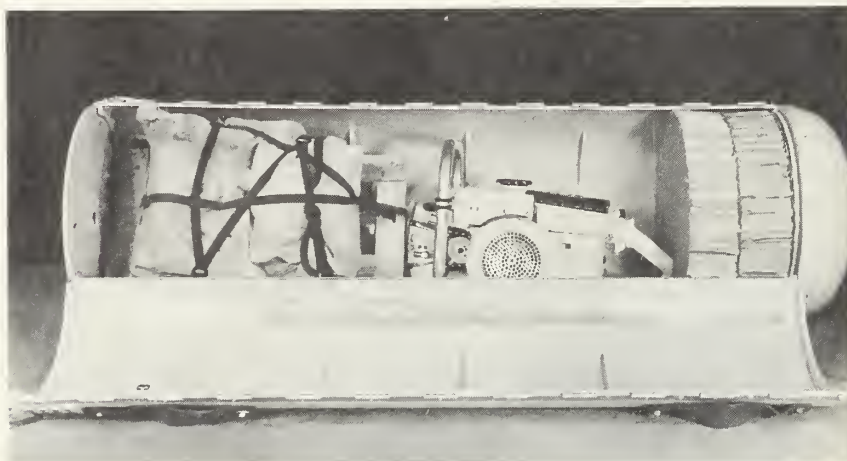


Figure 14

There is ample room for a power saw complete with all accessories and fuel. Paper honeycomb shock pad is placed on impact end.

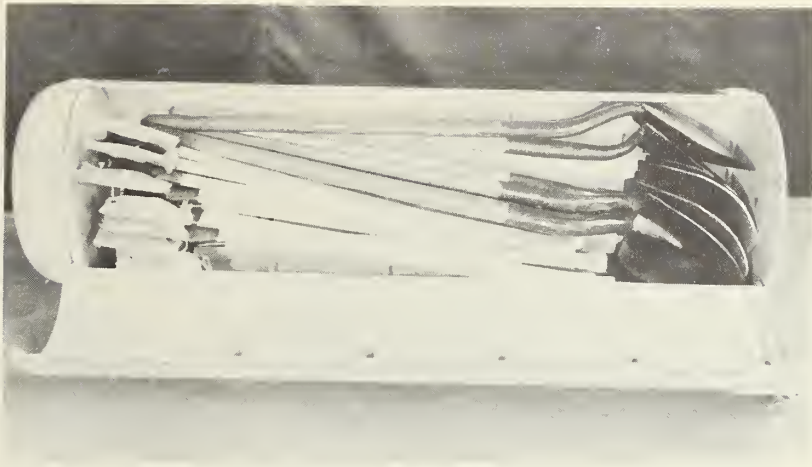


Figure 15
Shovels (No. 0) and pulaskis can be dropped with no special protective padding.

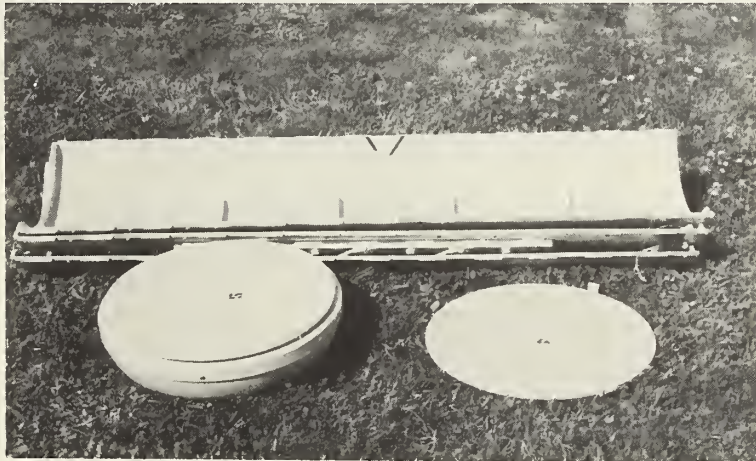


Figure 16
Outfit can be "knocked down" for recovery. All parts are numbered and scored for proper assembly.

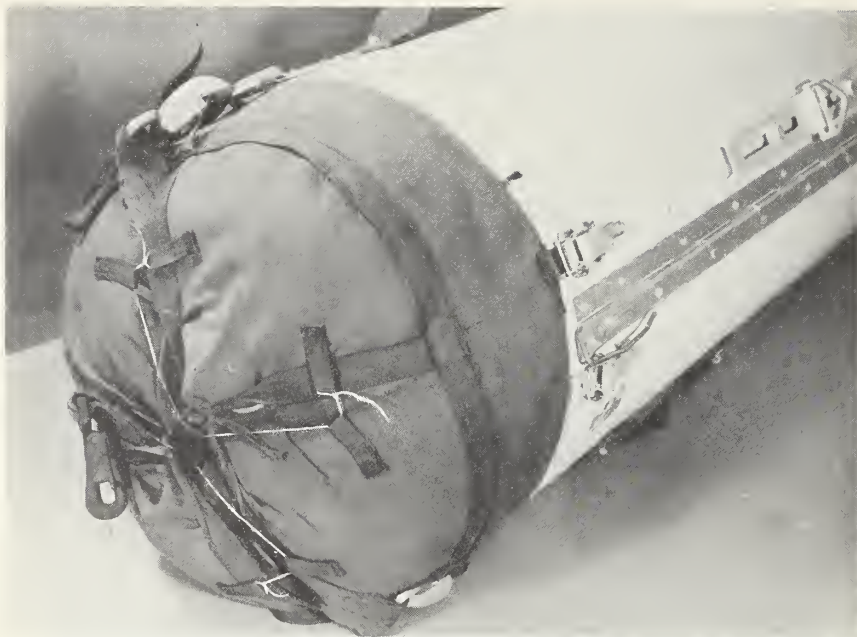


Figure 17

Parachute is attached to rear of container by spring loaded clasps. Parachute risers snap onto "V" rings riveted to side of container. Static line extends from under pack cover flaps and is fastened to aircraft with two turns of 80-pound break cord tape.

CANVAS AND FIBER BOX CARGO CONTAINERS

The Military A-6 cargo container (see Figure 18) can be easily

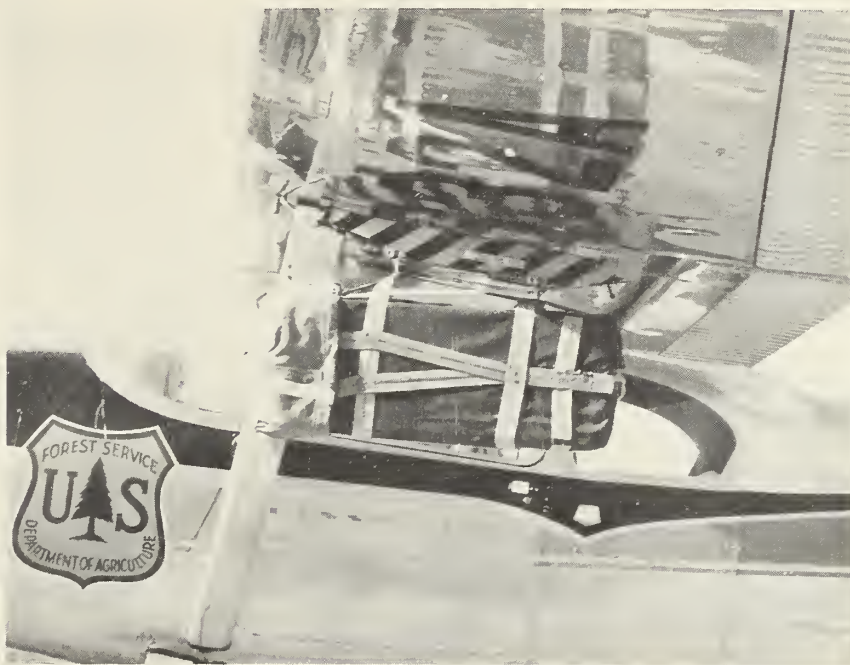


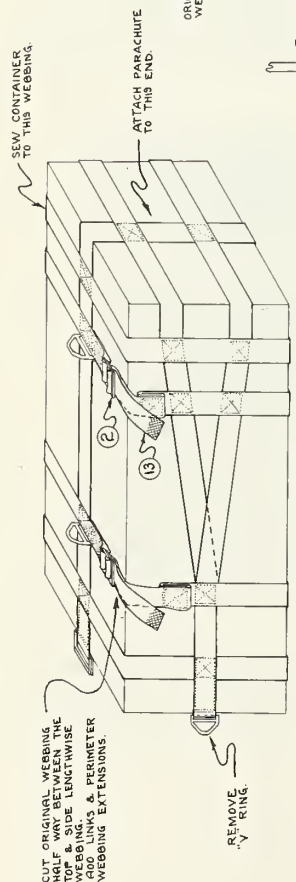
Figure 18

converted for use with Forest Service cargo parachutes by adding an outside elastic hemmed cover and an inner lacing cover to shield the parachute during flight. This model contains a 10-foot diameter cargo parachute. See Drawing No. ED-147-R1.

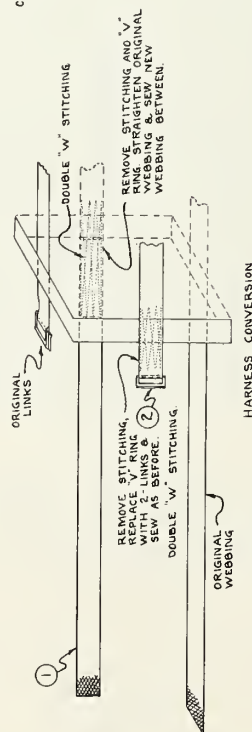


Figure 19

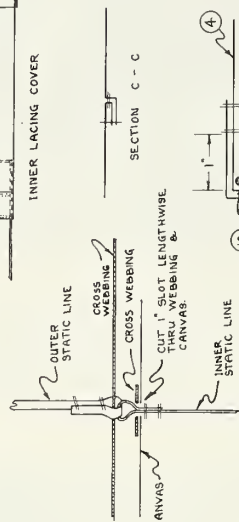
Drop tests of modified Military A-6 cargo container with 10-foot diameter cargo parachute. Static line and elastic cover remain attached to canopy. Rigging instructions are given in Appendix C.



ORIGINAL MIL. TYPE A-6 CONTAINER
(WEBBING HARNESS, CANVAS BAG
& FIBERBOARD CARTON)

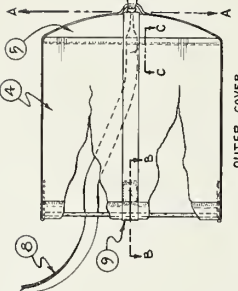


HARNESS CONVERSION

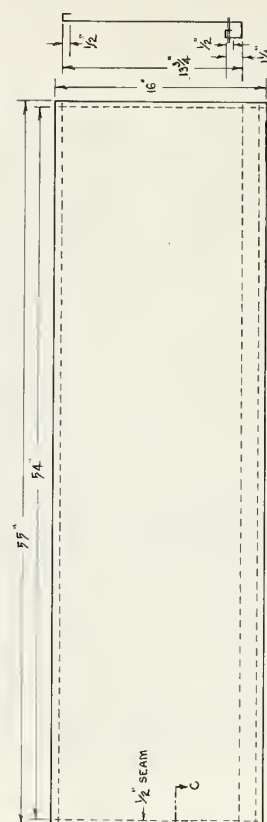


REMOVE STITCHING, REPLACE "V" RING WITH 2 LINKS & SEW AS BEFORE.

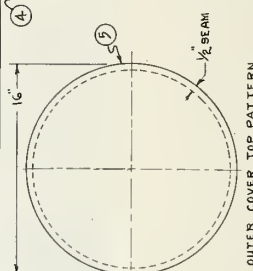
REMOVE STITCHING AND "V" RING STRAIGHTEN ORIGINAL WEAVING & SEW NEW WEAVING BETWEEN.



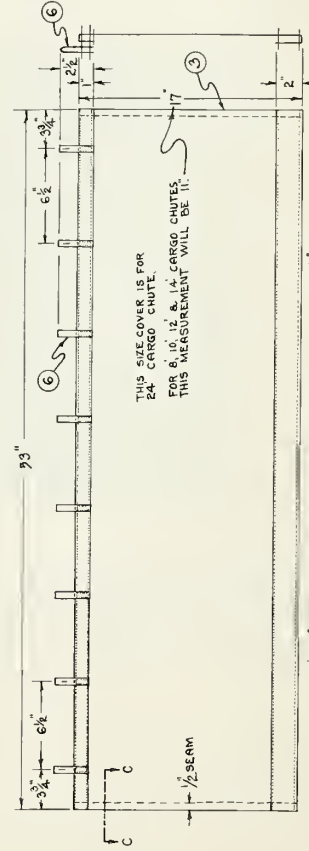
OUTER COVER.



OUTER COVER
MAIN PANEL PATTERN:



OUTER COVER TOP PATTERN



THIS SIZE COVER IS FOR
24" CARGO CHUTE.
FOR 8", 10", 12" & 14" CARGO CHUTES
THIS MEASUREMENT Varies



STATIC LINE DETAIL

NOTE:
ALL STITCHING FED. STD. 751 TYPE 301.

DATE	REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE MISSOULA EQUIPMENT - DEVELOPMENT CENTER		
FOREST SERVICE MIL TYPE A-G CONTAINER		
DESIGN OF A-R-K DESIGNED R.J.C. APPROVED W.C.W. DRAWN A.S. SPEC. DATE 10 June 1958		REVISION NUMBER EO-147-R1 SHEET NO 1 of 1

MATERIALS LIST TO ACCOMPANY DWG. NO. ED-147-RI

Name	Material	Part No. No.	Req.	Cutting Size	Color	Size	Specification or number	Type
Harness Extension	Webbing Cotton	1	1	36"	Natural	1-3/4"	MIL-W-5665a	VIII
Links, Connector	Steel	2	6		Cadmium	5/8"x 1-3/4"	AN-6562-1	Parachute
Cover, Inner Lacing	Cloth Cotton Duck	3	1	20"x53"	Natural	#10	CCC-C-419 Table I	I
Cover, Outer, Main Panel	"	4	1	16"x55"	"	"	"	"
Cover, Outer Top Panel	"	5	1	16" dia.	"	"	"	"
Loops, Lacing	Webbing Cotton	6	8	5"	"	9/16"	MIL-W-5665a	"
Static Line, Outer	"	7	1	80"	"	1-1/4"	MIL-W-5665a	III
Static Line, Inner	"	8	1	36"	"	"	"	III
Cover, Reinforcing Webbing	Webbing Cotton	9	2	24-1/4"	"	"	"	"
Cord, Elastic Exerciser	Rubber & Cotton	10	1	29"	Optional	3/16" dia.	MIL-C-5650 Table I	I
Ring, Hog	Metal	11	2		No. H1		Hill Pattern. Seymour Mfg. Co. or equal	
Thread	Cotton	12	As Req.		Optional	2/4 Cord	V-T-276b Table I Ticket #12	IB3
Perimeter, Webbing Extension	Webbing Cotton	13	2	15	Natural	1-3/4"	MIL-W-5665a	VIII
Tape, Adhesive	Fabric & Adhesive		As Req.		"		Optional	

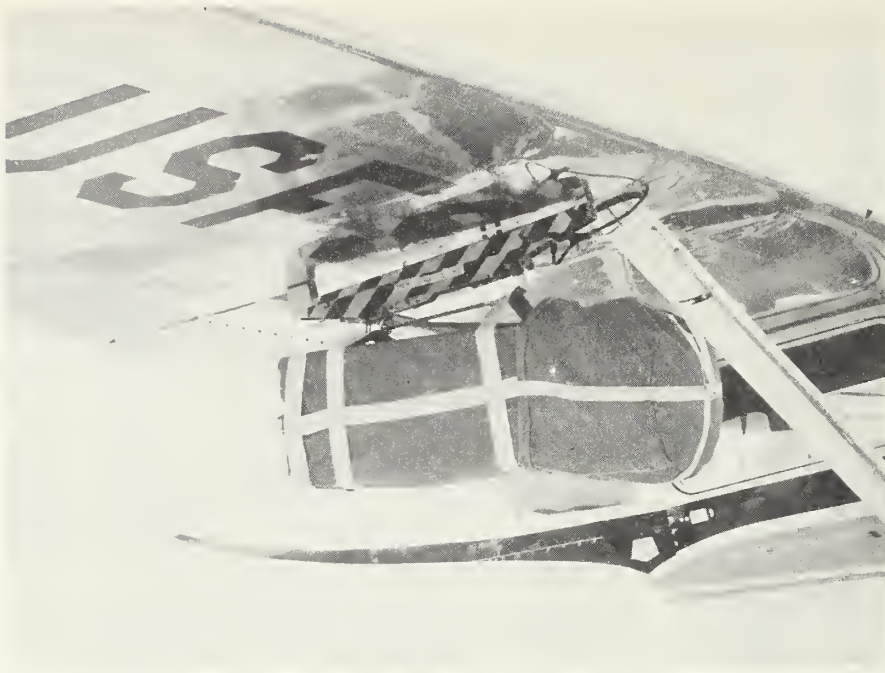
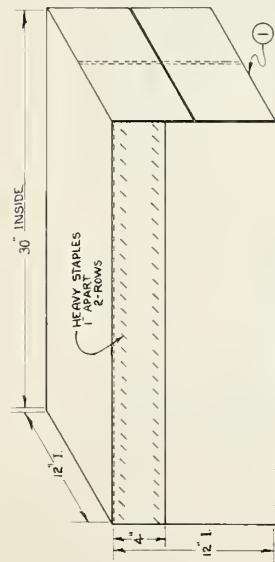
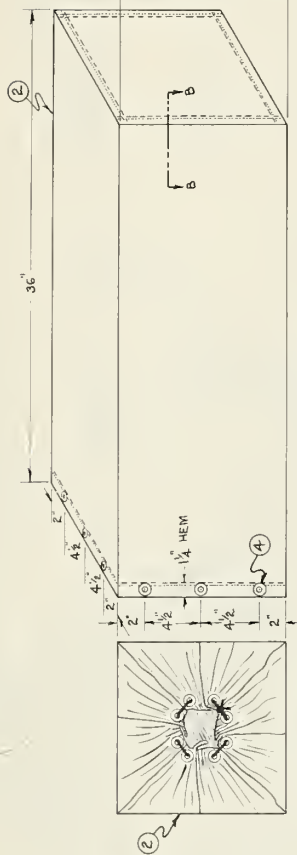


Figure 20

This container, similar to the modified Military A-6, is built to accommodate 24-foot diameter standard Forest Service parachute. See Drawing No. ED-149-R1. Rigging instructions are given in Appendix "C".

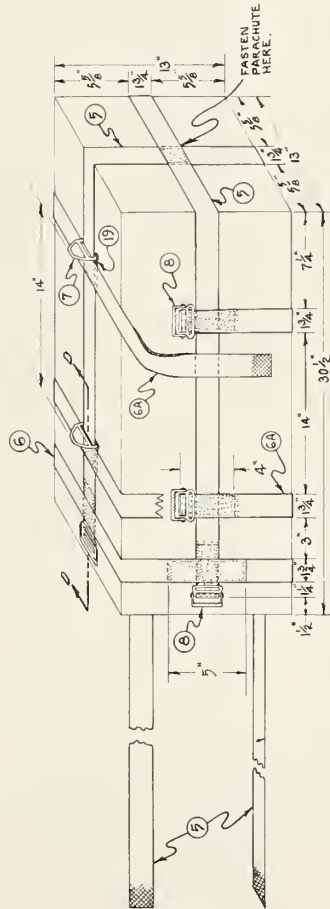


FIBERBOARD CONTAINER

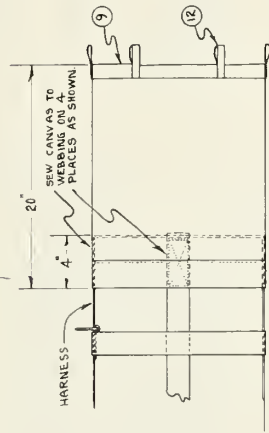


CANVAS BAG

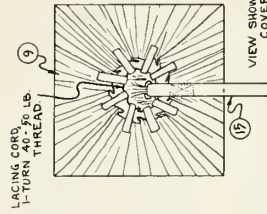
FRONT END



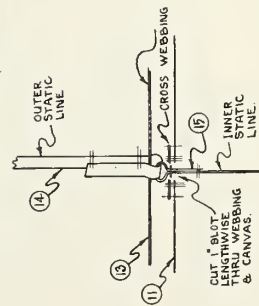
HARNESS



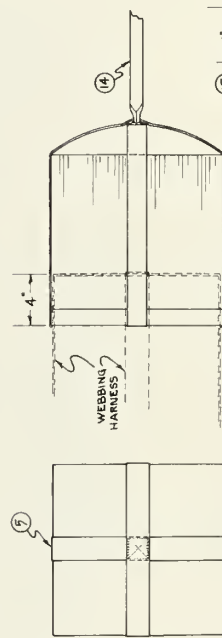
INNER LACING COVER



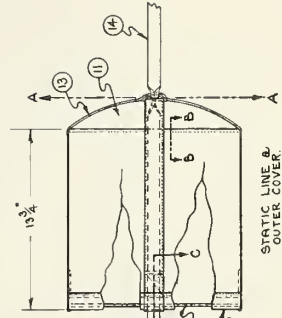
VIEW SHOWING INNER COVER LACED



SECTION A-A
LOOKING DOWN



FRONT END
WITHOUT CONTAINER



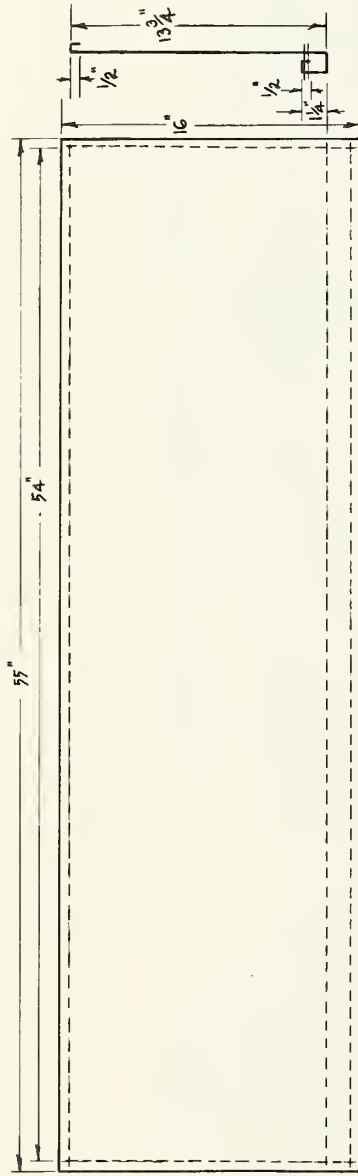
VIEW SHOWING
OUTER COVER ON CONTAINER



ELASTIC CORD DETAIL

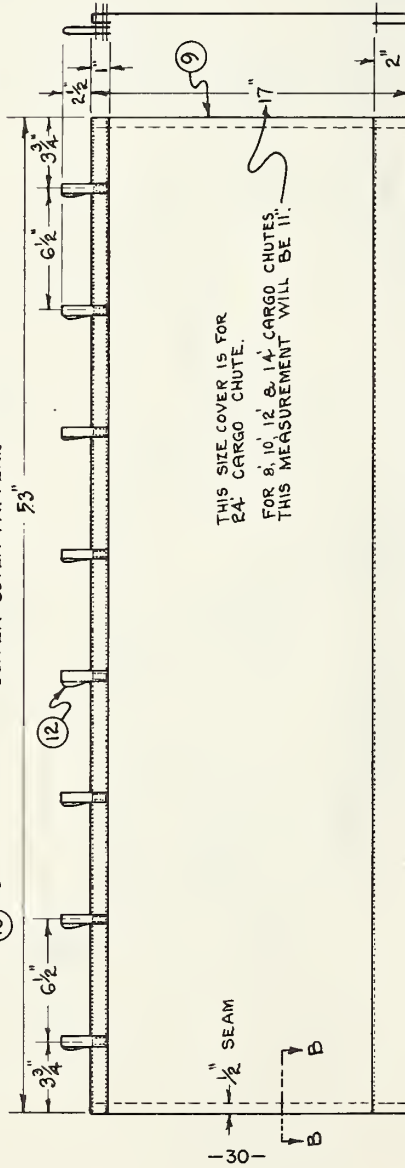
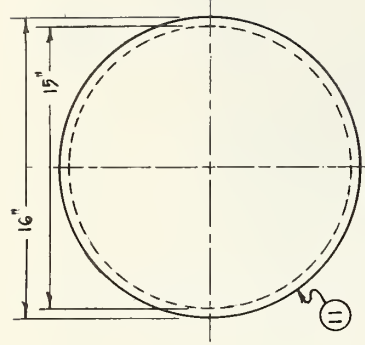
NOTE: ALL STITCHING: FED-STD. NO. 19, TYPE 301.

U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	
MUSKOGEE EQUIPMENT DEVELOPMENT CENTER	
VINEYARD CONTAINER DESIGNED FOR USE WITH FIBERBOARD BOX	
DATE	APPROVED
BY	FOR
PROJECT	ED-149-R1
DATE	JULY 1974

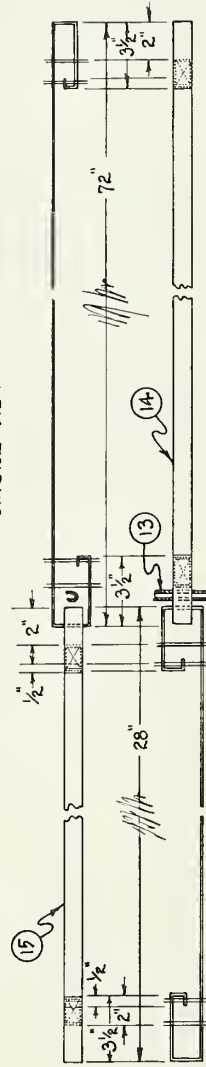


OUTER COVER PATTERN

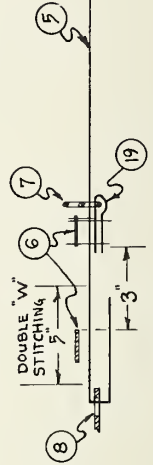
OUTER COVER
TOP PATTERN



INNER LACING COVER DETAIL
OUTSIDE VIEW

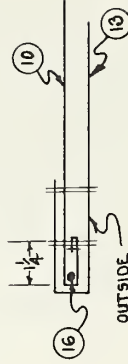


STATIC LINE DETAIL



SECTION D - D

SECTION B - B



DETAIL C - C

DATE	REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE		
MISSOURIA EQUIPMENT DEVELOPMENT CENTER		
CONTAINER, JETTISONABLE WING MOUNTED WITH FIBERBOARD BOX		
DRAWN BY	ARF	DRAWING NUMBER
CHECKED	GST	ED-149-R1
APPROVED	WGM	DATE
SCALE	AS SPEC	JULY 1950
DATE	JULY 1950	BY

MATERIALS LIST TO ACCOMPANY DWG. NO. ED-149-R1

Name	Material	Part No.	Reqd.	Cutting Size	Color	Size	Specification or Number	Type
Box, container, complete with 2 folding ends	Corrugated Fiberboard	1	1	As shown on dwg.	Natural	12"x30" inside	JAN-P-108, V3c	350 lb. p.s.i.
Bag, canvas, main panel	Cotton duck	2	1	52-3/4"x38"	"	#12	CCC-C-419 Table I	I
Bag, canvas, end panel	"	3	1	14-1/2"x14-1/2"	"	"	"	"
Grommets	Brass	4	12		Bronze	7/16" dia. inside	Grommet & washer equal to & interchangeable with Stimson #3	
Harness, main	Webbing cotton	5	2	116"	Natural	1-3/4"	MIL-W-5665a	VIII
Harness, cross member	"	6	1	56"	"	"	"	"
Harness, cross member adjustable	"	6A	2	64"	"	"	"	"
"V" ring	Steel	7	2		Cadmium	1-3/4"	AN-6563-1	Parachute
Buckles, webbing	Metal	8	4		"	"	North & Judd #025 or equal	
Cover, inner lacing for 24" dia. parachutes)	Cotton duck	9	1	20"x53"	Natural	#12	CCC-C-419 Table I	I
Cover, inner lacing (for small parachutes)	"	9A	1	14"x53"	"	"	"	"
Cover, outer, main panel	"	10	1	16"x55"	"	"	"	"
Cover, Outer, top Panel	"	11	1	16"x16"	"	"	"	"
Loops, lacing	Webbing cotton	12	8	5"	"	1/2"	MIL-W-5665a	I

MATERIALS LIST TO ACCOMPANY DWG. NO. ED-149-R1

	Material	Part No.	No. Req.	Cutting Size	Color	Size	Specification or Number	Type
Webbing, outer cover reinforcing	Webbing cotton	13	2	24-1/4"	Optional	1-1/4"	MLL-W-5665a	III
Static line, outer	"	14	1	80"	"	1"	"	II
Static line, inner	"	15	1	36"	"	1"	"	"
Cord, elastic	Rubber & cotton	16	1	29"	"	3/16" dia.	MLL-C-5650 Table I	I
Rings, hog	Metal	17	2			No. H1	Hill Pattern. Seymour Mfg. Co. or equal	
Tape, adhesive	Fabric & Adhesive	18	As req.		Optional		Optional	
Webbing, "V" Ring reinforcing	Cotton	19	2	5"	"	1-3/4"	MLL-W-5665a	VIII
Thread	Cotton	20	As req.		"	12/4 cord	V-T-276b Ticket #12	1B3

PAPER DRUM CARGO CONTAINER

Denzil R. Pipkin of the Wenatchee Forest developed a simple low-cost and efficient wing cargo container. It is a cylindrical paper drum of a type commonly used as a shipping carton attached to a parachute with a simple harness. The harness contains rings for attachment into bomb shackles and the parachute is shielded with light plastic film held in place by rubber bands. The parachute is deployed by static line tied by break cord to a 1-inch black-japanned harness ring which is affixed to the bomb shackle. Upon release the static line rips the protective plastic film and rubber retainer band from the container and deploys the parachute. Only a small black iron ring remains attached to the ship. This installation can be approved for specific aircraft under CAR, Part 8, Restricted Category. The work must be accomplished by a certificated aircraft mechanic and shown on form ACA-337. Rigging instructions and construction details covering the parachute cargo container and bomb shackle installation were obtained from the Regional Forester at Portland, Oregon.



Figure 21

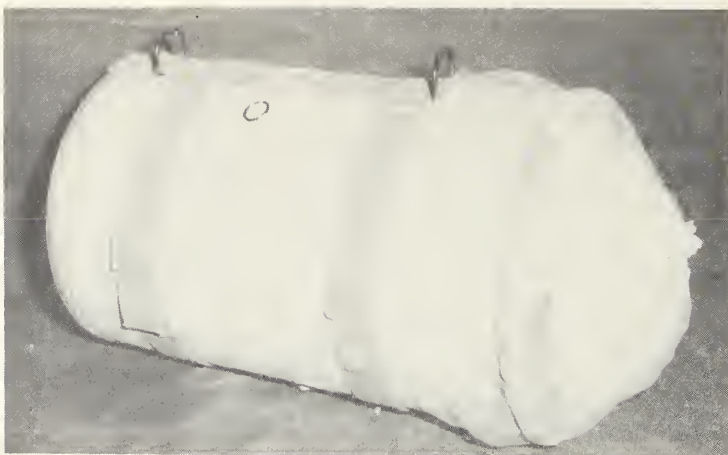


Figure 22

A sheet of plastic film held in place by an elastic band shields the parachute from air-stream. A 550-pound cord static line peels the plastic shield off and deploys the parachute. Mastic tape is used to hold parachute and static line in place during flight. Black iron ring tied with single turn of 40-pound break cord stays with aircraft after drop.

Figure 23
Rear view showing
harness arrangement
at container bottom.
Contents are stowed
in container
from forward end.

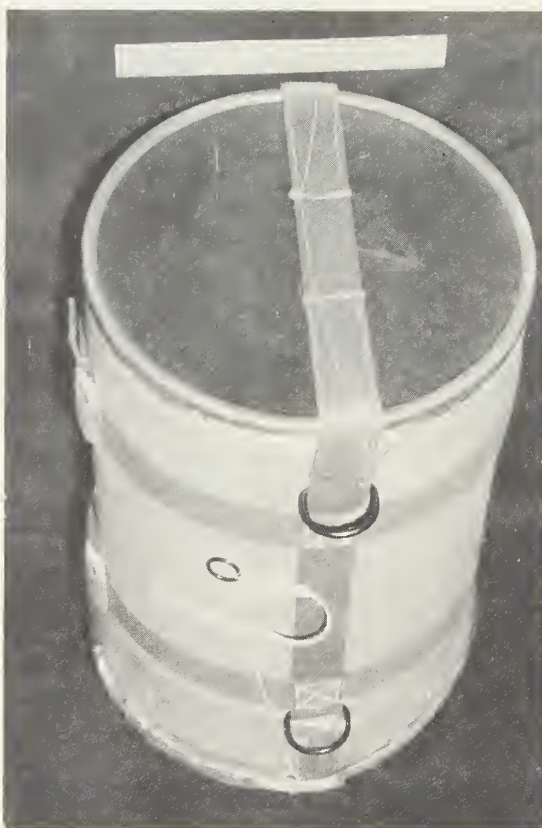




Figure 24
Drop test of paper drum container
with standard 12-foot diameter parachute.

APPENDIX A

INSTALLATION OF TWO-SHACKLE DROP SYSTEM

ON CESSNA MODEL 180 AND 182 AIRCRAFT IN ACCORDANCE WITH

SUPPLEMENTAL TYPE CERTIFICATE NO. SA4-868

A. Right-Wing Modification

1. Locate the lower front spar rivet pattern (detail A). Measure 1-5/8 inches out from station 100.00 skin edge. Remove the rivet located here. (This should be the second rivet outboard from station 100.00 skin edge.) Enlarge the rivet hole to .201-inch diameter.
2. Locate the lower rear spar rivet pattern (detail A). Measure 1-5/8 inches outboard from station 100.00 skin edge. Remove the rivet located here. Enlarge rivet hole to .201-inch diameter.
3. Place the shackle adapter (part No. 0600045) (detail B) underneath the wing and fasten to the under side of the wing with AN3-5A bolts and AN 365-1032 elastic stop nuts. The hanger brackets of the adapter are different lengths. The end of the adapter with the short bracket goes forward.
4. Install shackle (type S-2) (detail B) in adapter with AN 5-20A bolts, AN 960-516 washers, and AN 365-524 nuts.

B. Modification of S-2 Shackle-Control Cable and Installation of Shackle Wiring

1. Remove receptacle from free end of shackle-control cable. Remove black outer covering to within 6 inches of the fixed end. (Detail B) Note: The shackle-control cable has extra wires to accommodate military four-shackle system and salvo-release switches. Only two wires are used in the Cessna Model 180 and 182 installations.
2. Isolate the red and blue wires. Cut off all other wires even with end of the remaining 6 inches of black outer covering. Tape the ends of cut wires and wrap end of black outer covering, allowing only the red and blue wires to extend. Use standard electrician's tape.
3. Cut blue (ground) wire to 4-inch length beyond end of black outer covering. Remove insulation at cut end and install solderless AMP terminal No. 33023.
4. Drill 9/64-inch-diameter hole through inboard side of adapter at a point $1\frac{1}{2}$ inches back from front edge and $\frac{1}{2}$ inch up from lower edge of adapter.

5. Fasten blue (ground) wire terminal to inside adapter wall with AN 526-R632-6 bolt, and AN 365-632 elastic stop nut.
6. Measure and cut about 15 feet of No. 18 stranded insulated wire and fasten one end to the red (hot lead) wire with solderless AMP knife disconnecter No. 33030.
7. Cut a 12-inch length of $\frac{1}{4}$ -inch neoprene housing and slide it over the lead wire to cover the solderless disconnecter and the red wire to the point where the red and blue wires separate (detail B). Tape the neoprene housing in place.
8. Drill a $\frac{3}{8}$ -inch hole in the center of the wing--inspection plate located immediately forward of the wing strut. Install an AN 931-4-6 rubber grommet in this hole and insert the neoprene housing through the grommet.
9. Thread the red (hot lead) wire through the wing root (nose rib) lightening holes into the cabin interior, from under the wing-root cabin shield, then down along the forward door post (under the door-post cowling and cabin side panels) to a point behind the instrument panel about 10 inches below, and 6 inches to the right of the control column. (Allow enough slack for fastening to switches.) Note: Use electrician's tape to hold hot lead wire in place along this course.

C. Left Wing Modification

Repeat all the steps of A and B for left wing, same as right wing.

D. Installation of Shackle-Release Switches

1. Locate a blank area (at least 3 inches square) on the instrument panel, at a point easily reached by the pilot and where installation of two toggle switches, side by side, will not interfere with other panel instrument system (detail D). Note: This is largely dependent upon the number and size of radio controls in the instrument panel. In later models ample space can be found in the panel below and to the right of the control-wheel column.

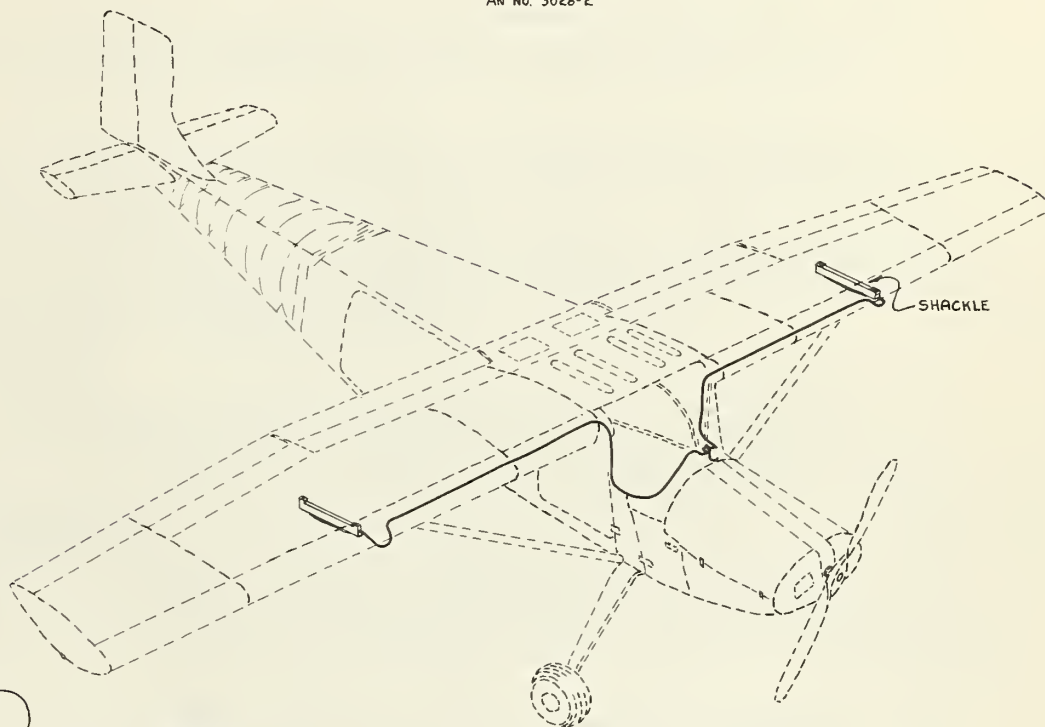
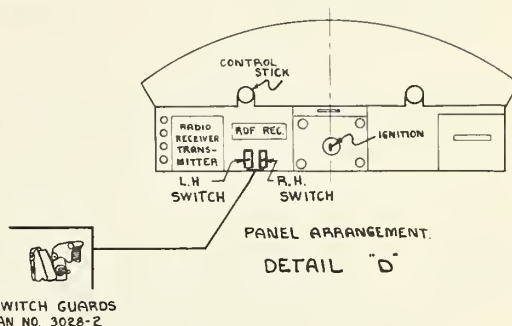
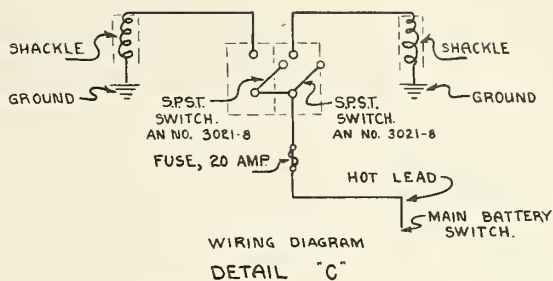
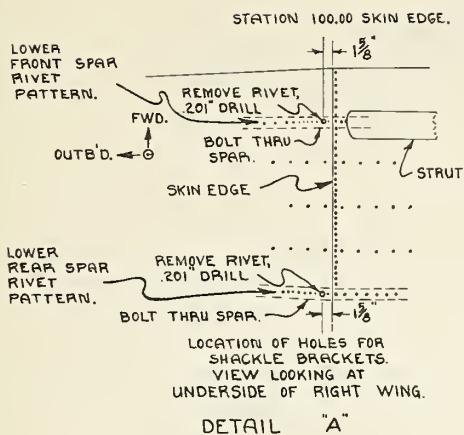
With pencil mark off the area. Use a center punch to indent both right- and left-hand release-switch mounting points. Use switch guards AN 3028-2 as marking guide, then drill panel for mounting. Use AN 3021-8 single-pole single-throw switches with AN 3028-2 switch guard over each switch.

2. Draw the left shackle hot lead wire through the left-hand switch mounting hole. Cut off excess wire and attach solderless AMP terminal No. 33023 to end of wire.
 3. Secure terminal of left lead wire to left toggle-switch top terminal screw.
 4. Place left switch in panel and fasten in place with switch guard over switch. Use AN 526-632-10 bolts.
 5. Placard left switch: "LEFT RELEASE," using $\frac{1}{4}$ -inch letters.
 6. Repeat steps 2, 3, 4, and 5 for right-hand switch, placarding "RIGHT RELEASE," in $\frac{1}{4}$ -inch letters.
 7. Make a short connector with 3 inches of No. 18 stranded, insulated wire with a solderless AMP terminal No. 33023 on each end. Attach connector to both switches at bottom terminal screws. Attach another No. 18 insulated wire to one of these bottom terminal screws, pass through a Littelfuse in the line-fuse holder No. 155020 with 20-amp. fuse, then on to master switch.
- E. Placard each bomb-shackle adapter in $\frac{1}{2}$ -inch letters, "MAX. LOAD 150 LBS."
- F. Install lanyard or pull-cord in the cocking ring at rear of each bomb shackle (detail B).
- G. Install parachute snap on shackle adapter as shown in detail B.
- H. Testing the Shackle Release
1. Place release switches in "off" position.
 2. Cock each bomb shackle.
 3. Move each switch upward to "on" position.

The respective bomb-shackle hooks should drop down simultaneously with switch change.

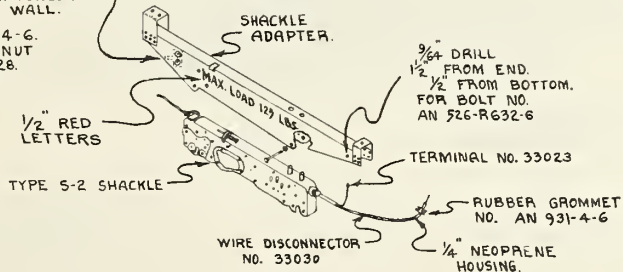
I. Weight and Balance Information

The effect of this modification will increase the basic weight 17.5 pounds and will be located approximately 50 inches aft of the datum line.



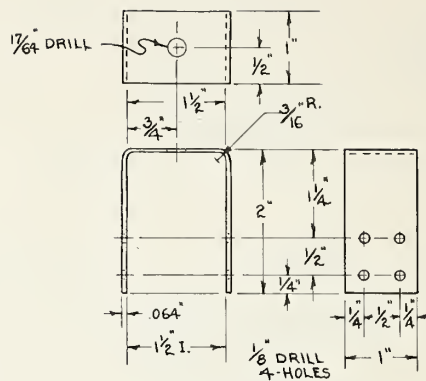
PARACHUTE HARNESS SNAP # 48 B 7884. BOLT SNAP ON INSIDE WITH TONGUE AWAY FROM WALL.

BOLT # AN 4-6. FIBERLOCK NUT # AN 365-428.

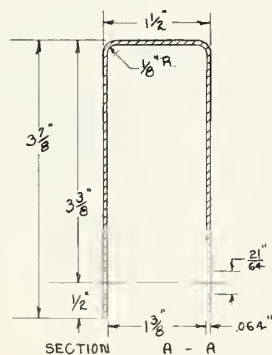
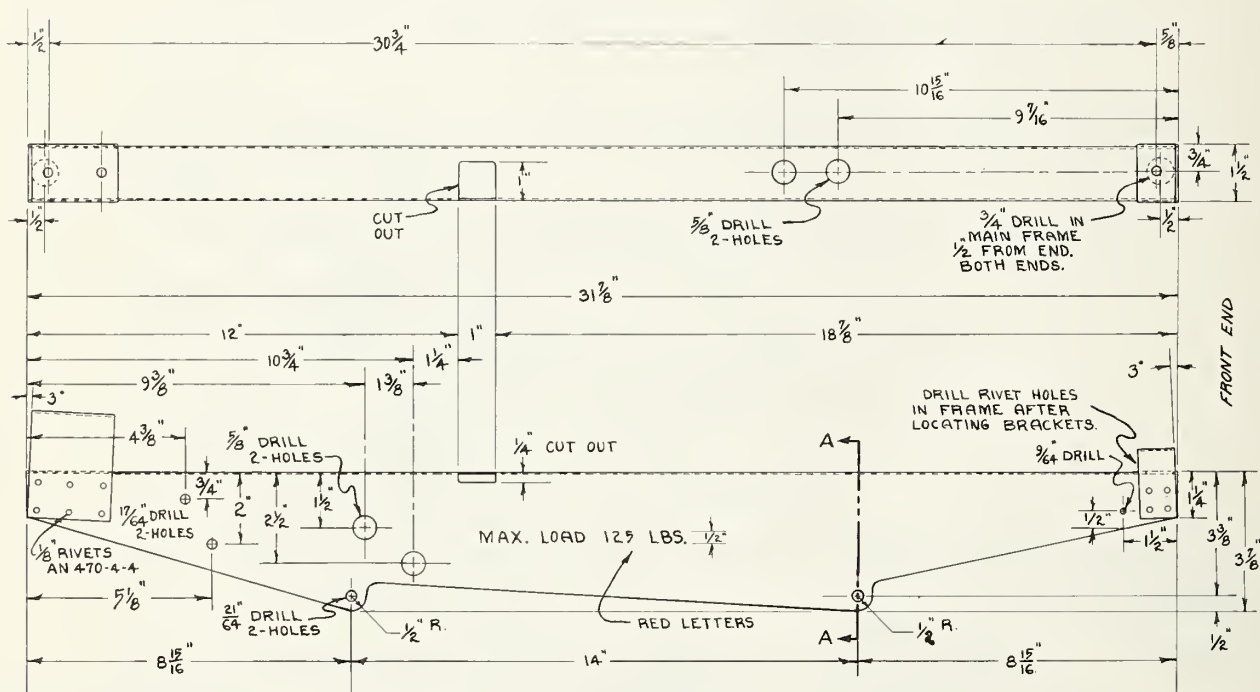


CONVERTED FROM BOMB SHACKLE.

6-1-59 WIRING		A.P.E.
DATE	REVISION	BY
U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE		
MISSOULA EQUIPMENT DEVELOPMENT CENTER		
CARGO SHACKLE RELEASE INSTALLATION FOR CESSNA-180 & CESSNA-182. COVERED BY SUPPLEMENTAL TYPE CERTIFICATE NO. 5A4-868		
DRAWN BY A.P.E.		DRAWING NUMBER
CHECKED D.G.T.		ED-148-P1
APPROVED W.G.W.		
SCALE AS SPEC.		SHEET NO 1 OF 2
DATE JUNE 1978		



FRONT BRACKET,
24 S.T. DURAL ALUM.



SHACKLE ADAPTER,
.064" 24 S.T. DURAL ALUM.

DATE	REVISION	BY
<p align="center">U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE</p> <p align="center">MISSOULA EQUIPMENT DEVELOPMENT CENTER</p>		
<p align="center">CARGO SHACKLE RELEASE INSTALLATION FOR CESSNA-180 & CESSNA-182. COVERED BY SUPPLEMENTAL TYPE CERTIFICATE NO. SA4-868</p>		
DRAWN BY	A.R.F.	DRAWING NUMBER
CHECKED	D.G.T.	
APPROVED	W.C.W.	ED-148-A1
SCALE	AS SPEC.	
DATE	F.I. 852	SHEET NO.

FEDERAL AVIATION AGENCY
5651 W. Manchester Avenue
Los Angeles 45, California

In reply, please
refer to: LA-235.2

United States Department of Agriculture
Forest Service
Missoula, Montana

AUG 6 1959

Subject: Issuance of Supplemental Type Certificate(s) Relative to
installation of shackle release at wing lift strut fittings,
right and left wings, on Cessna 180 and 182.

Gentlemen:

The necessary investigations associated with the subject design modification(s) have been completed, and we are transmitting herewith your Supplemental Type Certificate(s) No. SA4-868, Revised July 31, 1959.

The Certificate(s) reflect(s) the approval of your type design modification(s) and may be used to authorize identical modification(s) of other airplanes of the same model. The Certificate(s) may be transferred or otherwise made available to another party, such as by means of a licensee arrangement. You are requested to advise this office when you transfer or grant licensee rights to the Certificate(s), in order that we may take the necessary recording or reissuance action.

If you plan to manufacture for sale, articles in conformance with the subject Supplemental Type Certificate(s), you will be required to comply with Part 1.55 of the Civil Air Regulations. Parts shipped without identification and evidence of FAA inspection at source will not be eligible for installation in certificated aircraft. Application for Parts Manufacturing Approval should be made in letter form giving the part name and number, Supplemental Type Certificate number(s), and model of type certificated product for which the part has been approved for installation. The application should be addressed to the Chief, Manufacturing Branch, Federal Aviation Agency, 5651 West Manchester Avenue, Los Angeles 45, California.

Please do not hesitate to request any additional information we may be able to provide with respect to the Supplemental Type Certificate(s) or Parts Manufacturing Approval procedures.

Sincerely yours,



W. A. Klikoff, Chief
Aircraft Engineering Division

Enclosure(s)

FEDERAL AVIATION AGENCY
SUPPLEMENTAL TYPE CERTIFICATEINSTRUCTIONS - Submit in triplicate to local
FAA Flight Operations and Airworthiness In-
spector. Copy will be returned to applicant
upon issuance.

1. NAME AND ADDRESS OF APPLICANT

United States Department of Agriculture
Forest Service
Missoula, Montana

2. SUPPLEMENTAL TYPE CERTIFICATE APPLIED FOR:

☒ AIRCRAFT ☐ ENGINE ☐ PROPELLER

ORIGINAL MODEL DESIGNATION

Cessna 180 and 182

NEW MODEL DESIGNATION (If desired)

3. DESCRIPTION OF CHANGE

Installation of shackle release at wing lift strut fittings, right and left wings,
in accordance with drawing ED-148-R1 and U.S.F.S. instructions, dated June 4, 1959.

LIMITATION OF APPLICABILITY. This approval should not be extended to other
specific airplanes of these models on which other previously approved modifica-
tions are incorporated unless it is determined that the interrelationship be-
tween this change and any of those other previously approved modifications will
introduce no adverse effect upon the airworthiness of that airplane.

OPERATION LIMITATIONS. When this aircraft is operated with any load on either
or both shackles, it must be operated under CAR Part 8, in accordance with limita-
tions imposed as outlined in CAM 8.30-1.

4a. WILL DATA BE AVAILABLE FOR SALE OR RELEASE TO OTHER PERSONS?

☒ YES ☐ NO

b. WILL PARTS BE MANUFACTURED FOR SALE (Ref. CAR 1.35)?

☐ YES ☒ NO

5. SIGNATURE AND TITLE OF APPLICANT

June 4, 1959

DATE OF APPLICATION



SIGNATURE

L. M. STEWART, Air Operations Officer

TITLE

6. TO BE COMPLETED BY FAA

NATURE AND LOCATION OF DATA

U. S. Forest Service Dwg. No. ED-148-R1, Sheets 1 and 2.
U. S. Forest Service Installation Instructions DGT, dated June 4, 1959.Data are on file in the Aircraft Engineering Division, FAA, Region IV,
Los Angeles, California.

Certification Basis: CAR 3 and 8.

ORIGINAL TYPE CERTIFICATE NO.

5A6 and 3A13

SUPPLEMENTAL TYPE CERTIFICATE NO.

SA4-868

DATE OF APPROVAL

July 17, 1959
Revised: July 31, 1959FAA APPROVAL
FAA

W. A. Klikoff

SIGNATURE

Chief, Aircraft Engineering Division

TITLE

APPENDIX B

RIGGING INSTRUCTIONS FOR CONVERTED T7A PARACHUTE FOR FOREST SERVICE USE WITH FIBERGLASS CONTAINER

These parachutes are originally packed for military use involving extremely high launching speeds and heavy loads. A skirt hesitator tape was employed to reduce opening shock forces. The skirt hesitator band must be removed to ensure reliable openings from slow flying reconnaissance aircraft.



Figure 25

Carefully cut through hesitator band with scissors held parallel to lines.

1. For canopy folding and pleating instructions refer to FSH 5713.21c, Steps 1 through 9.

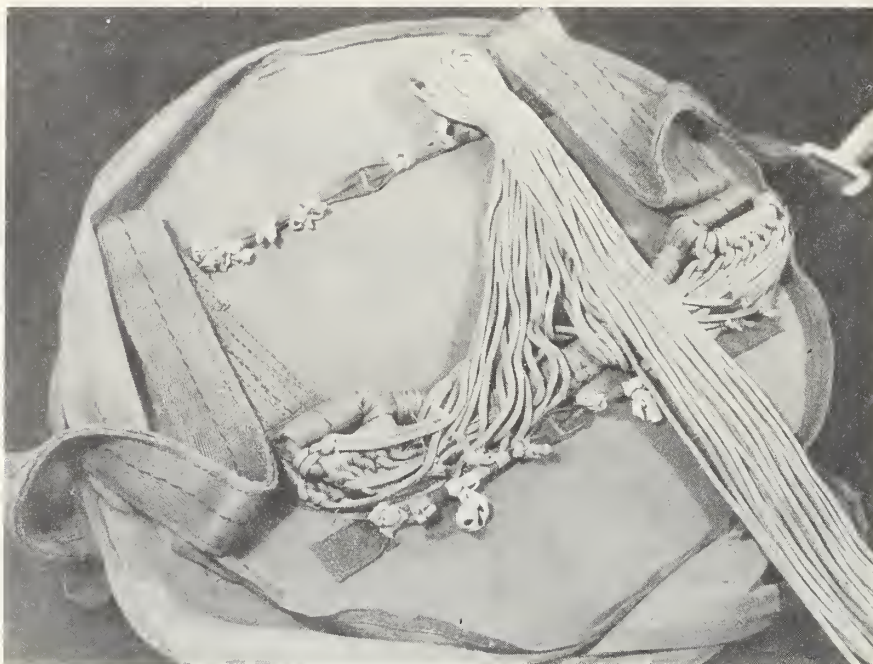


Figure 26 - Step 10 (FSH 5713.21c)
Lay the risers on the tray with both snaps tongue side down. Place the first stow at the far left side of container bottom.



Figure 27 - Step 11 (FSH 5713.21c)
Stow remaining lines leaving about 12 inches between last stow and skirt.



Figure 28 - Step 12 (FSH 5713.21c)
Place skirt on tray and fold canopy accordion fashion. Remove original apex break cord tape and tie static line to canopy apex with a single turn of 550-pound cord (white)

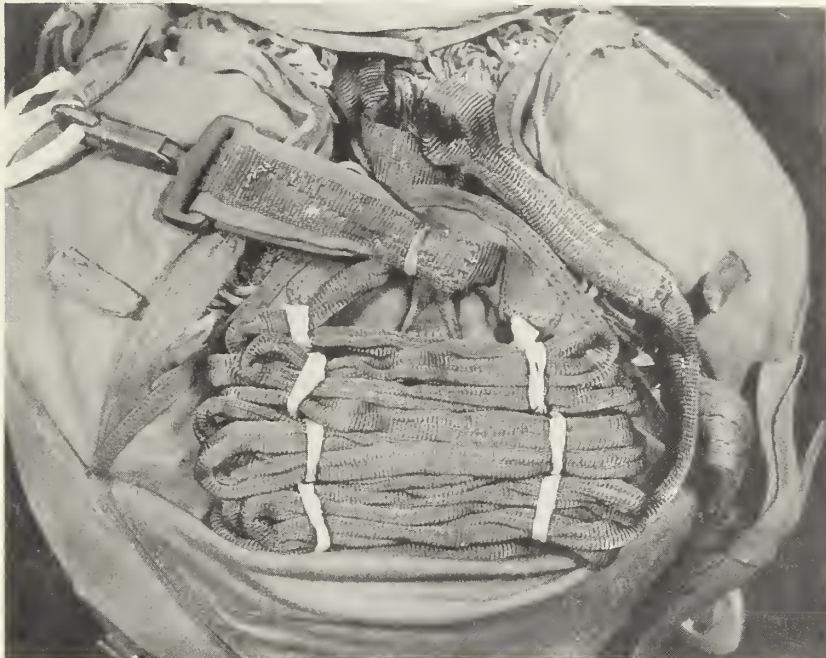


Figure 29 - Step 13 (FSH 5713.21c)
Stow static line on inside flap leaving about 6 inches of the free (snap) end protruding. Form a double turn of 80-pound tape, tied with a square knot followed by an overhand knot. Insert both turns (upper left) through static line snap. This is the break cord tape that must be attached to aircraft to deploy parachute.



Figure 30 - Step 14 (FSH 5713.21c)

Close the container flaps. Insert a single turn of 80-pound tape through the static line loop and through each flap lacing loop. Pull flaps tight and tie off with a square knot followed by an overhand knot. Insert a single length of 40-pound cord through secondary lacing loops and static line loop, pull taut and tie off with non-slip knot.

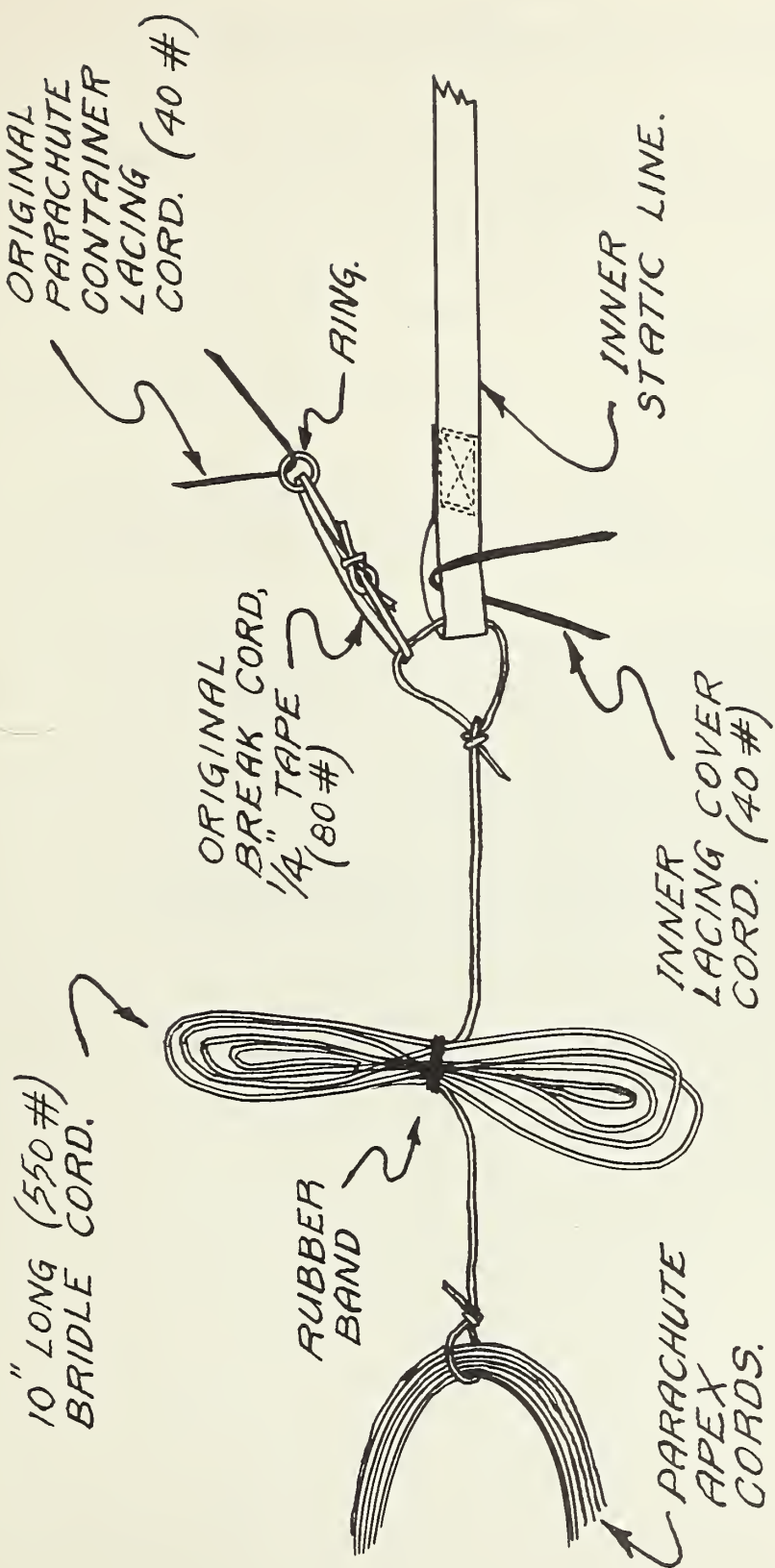
APPENDIX C

RIGGING INSTRUCTIONS FOR ATTACHING PACKED FOREST SERVICE STANDARD 24-FOOT CARGO PARACHUTE TO PLYWOOD OR MODIFIED MILITARY A-6, WING CONTAINERS

Note: Refer to Drawing No.'s ED-188-R1, 120-R1, 147-R1 and 149-R1.

1. At forward end of the cargo container, insert the cargo parachute riser under the intersection of the main harness members and secure the riser snap to the riser "V" ring.
2. Place the cargo parachute inside the inner lacing cover and press it firmly against the fixed partition.
3. Work the loop in the free end of the parachute bridle cord outside the container. (This is the loop which is tied to the black iron ring with a single turn of 80-pound break cord tape; the other end is tied to the canopy apex.) Do not break the original parachute container lacing cord nor the 80-inch tape.
4. Untie the loop in the free end of the bridle cord and connect it to the inner static line with a bowline knot inserted through the webbing loop at the end of the inner static line. Make sure the original 80-pound tape break cord loop still passes through the bridle cord bowline loop. (This ensures that the container lacing cord on the packed parachute will be broken by the inner static line.)
5. Insert a single turn of 40-pound cord through all inner lacing cover loops and through the loop in the end of the inner static line. Draw the cord tight and tie in a non-slip knot. There should be a 3-or 4-inch diameter circle formed by the cord where it goes through the inner static line loop and inner cover lacing loops.
6. Loosely fold the inner static line across the top of the inner lacing cover.
7. Stretch the elastic ("bungee") opening of the outer cover and place it over the inner lacing cover.
8. Work the outer cover down squarely and as far as it will go on the cargo container (must extend down far enough for elastic cord in outer cover to be below the rim of the plywood reinforcing band.)

9. Make 6-inch long accordion folds in the outer static line and insert it under the elastic cord hem of the outer cover. Leave a free end about 12 inches long for attaching the static line to cargo shackle parachute snap.
10. Tie a 2-inch single loop of 1/4 inch (80 pound) tape through the webbing loop in the outer static line. (This is the break cord which will be inserted in the parachute snap bolted to the bomb shackle.)



NOTE: THIS DRAWING IS
TO ACCOMPANY DWGS.
NO. ED-120-R1
ED-147-R1
ED-149-R1.

METHOD OF ATTACHING
CARGO CHUTE TO WING
CARGO CONTAINER FOR
DROPPING.

SCHEMATIC DRAWING
NO. ED-188-R1.

APPENDIX D

GENERAL REQUIREMENTS FOR WING CARGO CONTAINERS

1. Frontal area for each container should not exceed 324 square inches (18 inches by 18 inches).
2. Length should not exceed 55 inches.
3. Maximum total weight (container, parachute and cargo) should not exceed 150 pounds.
4. Minimum weight (container, parachute and cargo) should be less than 25 pounds.
5. Container assembly should be able to withstand a static load equal to three and one-half times maximum payload (evenly distributed in container) when suspended by shackle attaching rings.
6. Shackle attaching rings should be attached to container to provide best balance for intended loads. Rings must be spaced at top center of container 14 inches apart.
7. Parachute shall be shielded from premature deployment either by protective covers or special lacing.

Operational Limitations - When the aircraft is operated with any load on either or both shackles it must be operated under CAR, Part 8, in accordance with limitations imposed as outlined in CAM 8.30-1.

Wing cargo containers and payload are to be included in gross weight limitations.

